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ABSTRACT

This paper examines patterns of English discourse related to computer science and makes suggestions for the design and content of a technical writing course in English as a Second Language for computer specialists. An introductory section provides background information on computer science education and two professional associations with which computer science students, professionals, and teachers of English for Special Purposes (ESP) for computer science should be familiar. Subsequent sections outline: (1) results of research on the types of writing found in computer science and examples of vocabulary common in the field (specialized, non-specialized, high-frequency general English, and high-frequency or problematic grammatical features), and (2) recommended language-related course content and other course or program features, including tutorial and editing services, opportunities for collaboration and authentic writing experience, testing, and faculty development. Contains four references. (MSE)

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Writing Instruction for the Computer Sciences

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March 12, 1997

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Abstract:
This colloquium paper describes an ESP writing program ideal for students and professionals in the field of computer science. Based on research conducted at the University of Aizu's Center for Language Research in Japan, this paper describes written discourse characteristic of the computer science discipline and details how this writing can be taught to NNSs studying or working in this profession.

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Abstract

This colloquium paper describes an ESP writing program ideal for students and professionals in the field of computer science. Based on research conducted at the Center for Language Research in Japan, this paper describes written discourse characteristic of the computer science discipline and details how this writing can be taught to NNWs studying or working in this profession.

1 Introduction

The goal of ESP[1] writing instruction for computer science is to orient NNWs[2] to the written English discourse that computer professionals normally employ to accomplish profession-related tasks. Computer science is a text-oriented, text-producing discipline, where both students and professionals generate vast quantities of written English discourse in very short periods of time. Writing instruction for computer science must address the writing needs of both groups since both of these are primarily composed of NNWs who must write in English for their international colleagues around the world. A good ESP writing program must consider this and respond accordingly.

2 An Overview of Computer Science

To understand writing in the computer field, one must first understand something about computer science. The Association of Computing Machinery defines computer science as *the systematic study of algorithmic processes that describe and transform information — the theory, analysis, design, efficiency, implementation, and application. The fundamental question underlying all computer science is "What can be efficiently automated?"*

The work of most computer scientists revolves around research. Some computer scientists are software engineers, some are hardware engineers, and some are theoreticians with strong math and physics orientations.

[1] English for Specific Purposes
[2] Non-Native Writers

Though the computer field is extremely broad and has engendered areas of specialization in nearly every other discipline, many computer scientists belong to either one or both of the following two professional organizations:[3]

1. The Association for Computing Machinery (ACM) (http://www.acm.org)

2. Institute of Electrical and Electronics Engineers (IEEE) (http://www.ieee.org)

Among the 37 technical societies within the Institute of Electrical and Electronics Engineers, the IEEE Computer Society (http://www.computer.org) is especially popular.

These two organizations powerfully influence the direction and culture of computer science as well as disseminate and archive most of the field's knowledge. Familiarization with the activities and publications of these two organizations is vital for CS[4] professionals, CS students, and ESP writing teachers working with learners in computer fields.

3 Writing in the Computer Sciences

Computer scientists produce large quantities of text for various professional purposes at a very quick pace. Research must be carried out quickly and the results disseminated rapidly before other researchers "get their first." Writing, however, is not only used to document and disseminate research. Written discourse is also used to accomplish a large number of other professional tasks, some research-related and others not. Here are a few examples of written discourse in the computer field:[5]

3.1 Genres

- reading and research notation
- e-mail messages
- e-mail discussions
- newsgroup postings
- proposals
- progress reports
- technical reports
- conference papers (published in conference proceedings)
- white papers (for industry)
- position statements (for panel discussions)
- correspondences (1-4 page letters to/from an editor or SIG chair)
- concise papers (5-14 page journal articles)
- regular papers (15-35 page journal articles)
- referee reports (evaluations and revision advice)
- biographical sketches
- abstracts
- acknowledgments

[3]The ACM currently has over 80,000 members, and the IEEE has roughly 320,000 members. Membership nationalities span approximately 147 countries.

[4]Computer Science

[5]For more detailed treatment of written discourse in the computer sciences, see Orr 1995.

- chapters in books
- whole books (textbooks and scholarly books)
- text for speeches and keynote addresses
- OHP, 2x2, or computer-based slides (to accompany presentations)
- supporting text in video and multimedia presentations
- PR (brochures, conference announcements, posters, calls for papers)
- book/software/hardware reviews
- on-line computer documentation
- instruction manuals
- business letters
- reprint requests
- cover letters
- request letters (to obtain information, funding, assistance)
- letters of recommendation
- invitation and thank you letters
- Web pages (of many genres)
- resumes
- educational material (instructions, exercises, quizzes, exams, etc.)

Source of Information: CS practitioner questionnaires, CS resumes, ACM/IEEE publications

In addition to introducing genres to computer students and professionals who desire English instruction in this area, an ESP writing program should also deal with other aspects of written discourse in the computer profession. Here are some examples:

3.2 Examples of Specialist Computer Vocabulary

areal density, benchmark, command queuing, femtosecond, hypercube, LISP, synchrostratum, thermionic, Unicode, wafer, WAIS[6]

Source of Information: electronic analysis of CS documents, CS dictionaries, glossaries in CS textbooks for CS majors

3.3 Examples of Non-Specialist Computer Vocabulary

computer screen, click, delete, e-mail, file, font, key, keyboard, highlight, Internet, menu, mouse, printer, scan, Web page, window, World Wide Web (vs. Worldwide Web)[7]

Source of Information: electronic analysis of CS documents, general dictionaries, glossaries in CS for non-specialists

[6]This vocabulary should be taught by computer scientists who cover this material in computer science courses. ESP faculty should teach the English used in the definitions and explanations of these specialist terms.

[7]This vocabulary should be taught by language teachers.

3.4 Examples of High Frequency General English Vocabulary

analysis, application, device, efficient, human, management, perform, problem, project, research, results, such, time, use, verify, which

Source of Information: electronic analysis of CS documents

NOTE: See Orr, T., Christianson, K., Goetze, C., & Okawa, H. (1995) for specific research on vocabulary selection for instructive purposes in the computer science profession.

3.5 High Frequency or Problematic Grammatical Features

Adjective Clauses: This paper discusses some general requirements for CASE tools *which support object-oriented software development.*

Passives: In this paper, a model of a heterostructure bipolar transistor incorporating an RT collector structure *is developed and discussed.*

Anthropomorphization:[8] computers *perform*, the screen *shows*, a computer program *instructs*, this paper *presents*[9]

Source of Information: analysis of CS documents, analysis of errors in preliminary drafts by NNWs, other articles on this topic

4 Writing Instruction for the Computer Sciences

One characteristic of ESP is that language instruction is tailored to meet the specific needs of specific language learners in a specific learning context. Consequently, there is no one-size-fits-all approach to writing instruction. Each ESP teacher must assess the learning needs of his/her students and prescribe a learning plan that can efficiently meet these needs within an alloted time frame.

4.1 Necessary Content

Though specific curriculums may differ, good ESP writing instruction for NNWs in computer science should include development in the following areas:

- vocabulary (academic, computer, and language-related)
- grammar (correction and instruction)
- sentences (expand repertoire, improve quality)
- paragraphs (expand repertoire, improve quality)
- academic and CS genres (expand repertoire, improve quality)
- formatting conventions
- formatting systems (word-processing software, LaTeX, HTML)

[8] inanimate subjects with active verbs

[9] This seems to be especially problematic for Japanese. See Kojima, S., & Kojima, K., 1978.

Instruction in these areas can be included in each level of writing education in increasing levels of sophistication. For example, grammar instruction in preliminary writing courses could cover issues such as verb tense and count/non-count nouns, while more advanced writing courses study clause structures and complex nominalization patterns frequent in computer science. As students advance to higher level writing courses, the same content categories would include increasingly complex language instruction in increasing relevance to computer science discourse.

4.2 Necessary Services and Opportunities

A good ESP writing program for students and professionals in the computer science discourse community should also include these features:

- one-to-one tutorial services for student writers
- one-to-one editing services for professionals
- collaboration on assignments between writing and CS instructors
- plentiful opportunities for writing in authentic contexts
- proficiency testing and progress development records
- continual analyses of NNW weaknesses
- continual analyses of excellent writing
- continual improvement of writing instruction
- continual self-development by the writing faculty[10]

A writing program must not consist merely of independent writing courses loosely related to each other and to computer science culture, but the program must contain well-coordinated parts complemented by helpful support services and authentic writing opportunities.

5 Conclusion

Curriculum designers and writing instructors who support students and professionals in the field of computer science must commit themselves to serious investigation of computer science discourse, computer science culture, and instructional methodologies that will enable their language learners to successfully accomplish academic and profession-related tasks with their texts. A thorough understanding of learner needs is important as well as a unified writing program that can address these needs appropriately. The computer science profession is rapidly growing and the need for competent ESP writing instruction in this discipline continues to expand at an equally rapid rate.

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[10] See Orr 1997.

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